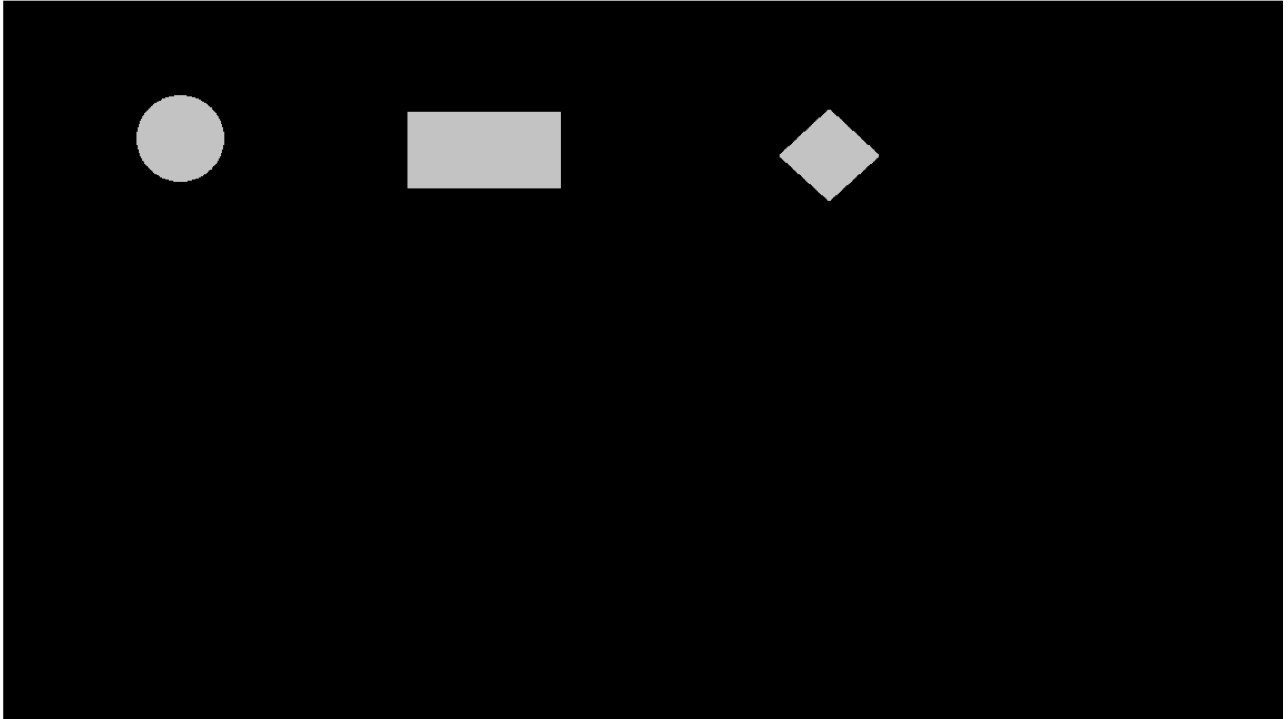
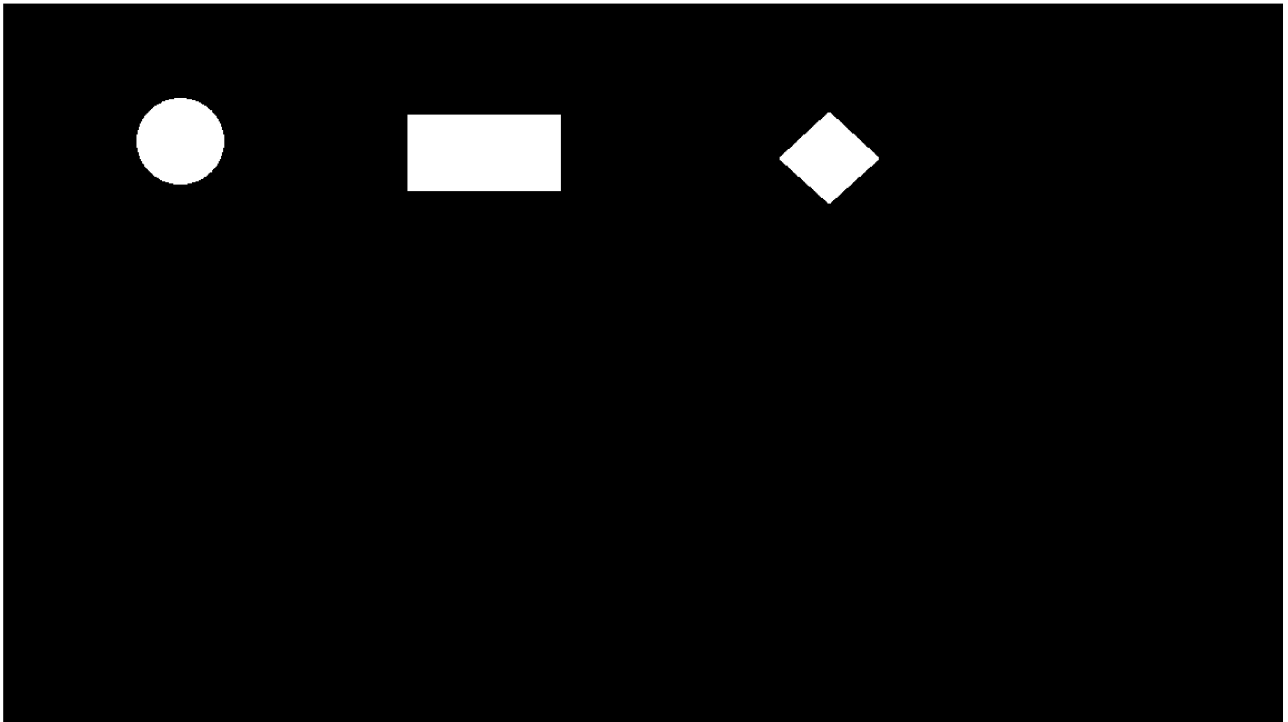


```
% Ex1
clear variables

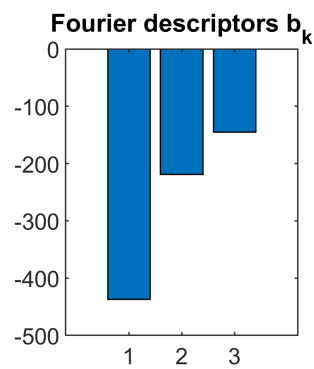
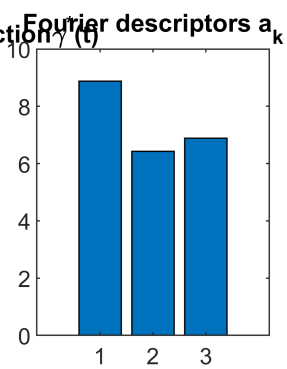
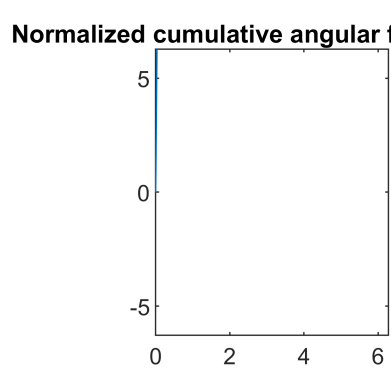
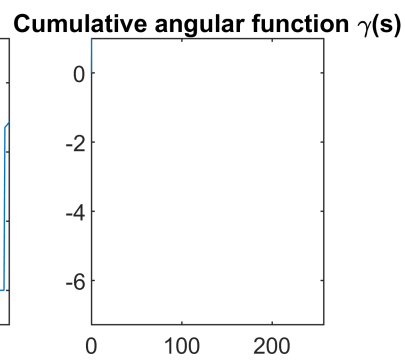
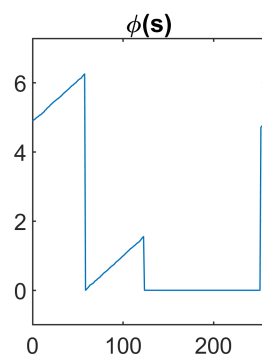
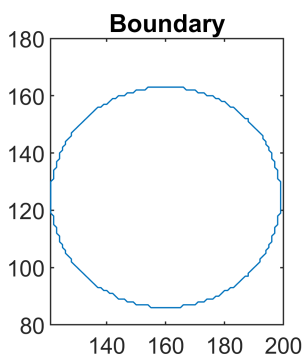
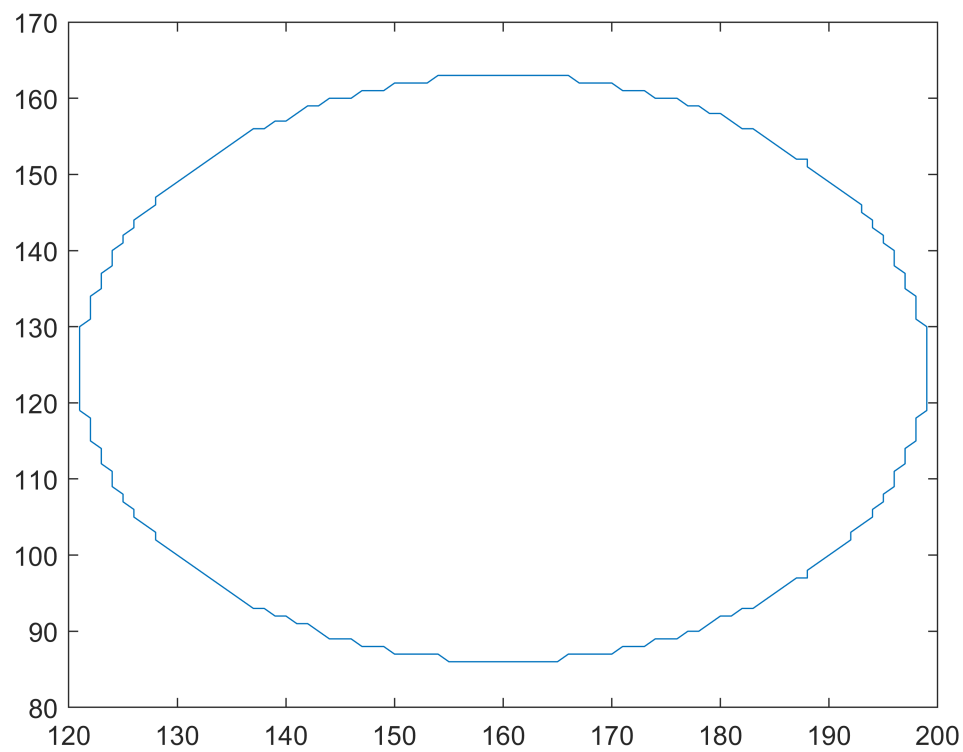
im = imread('Objects.png');
imshow(im)
```

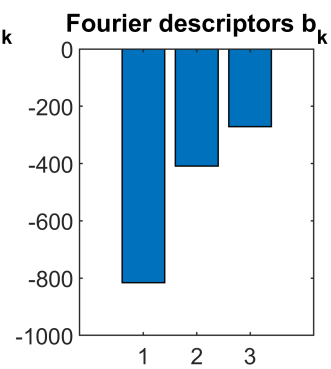
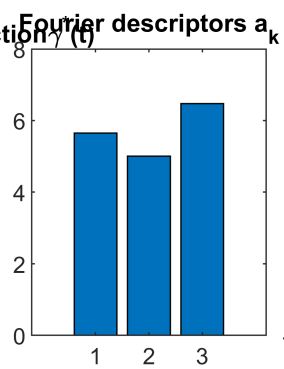
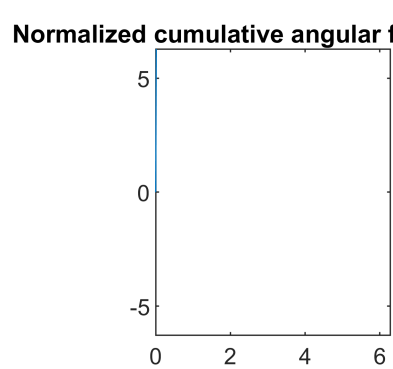
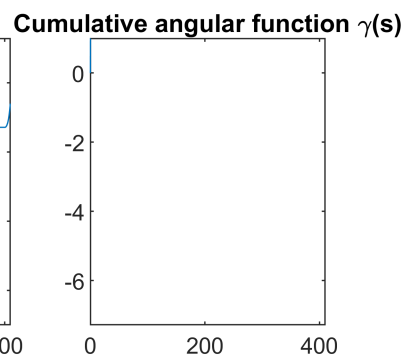
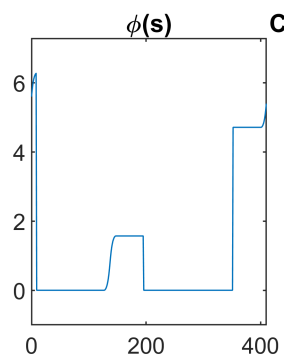
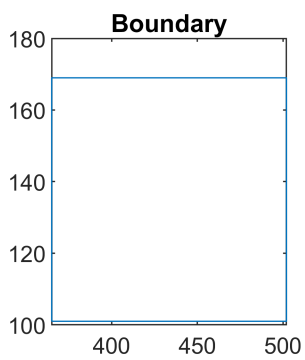
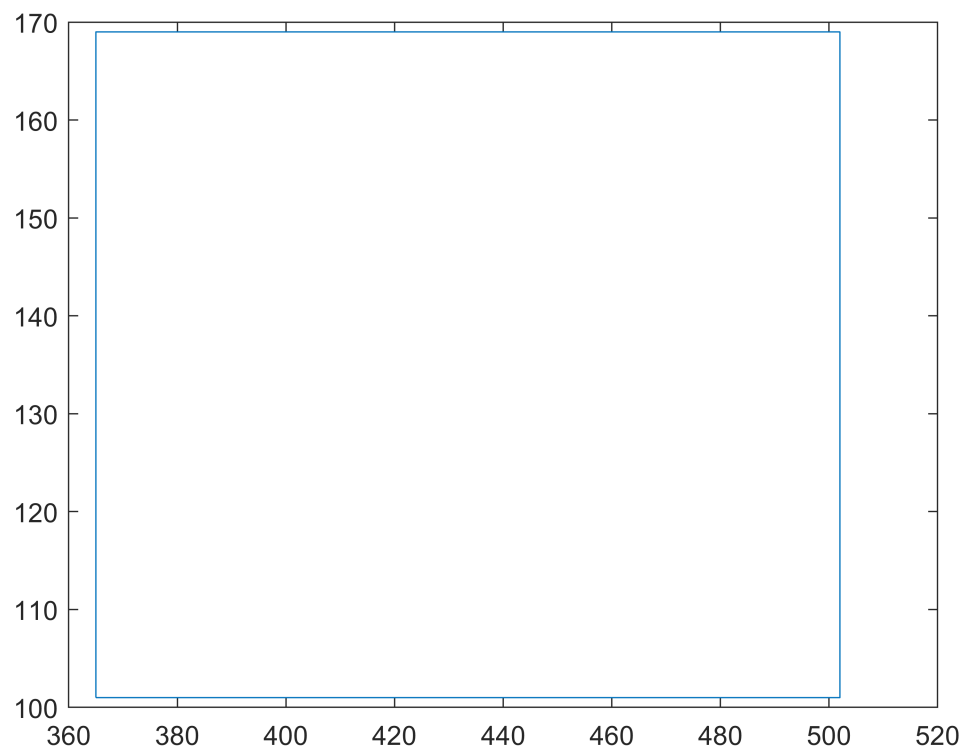


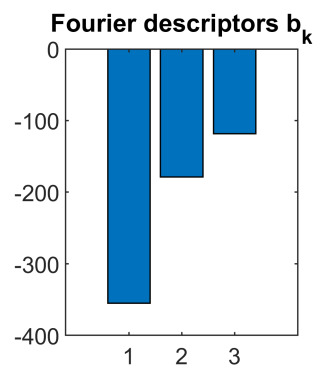
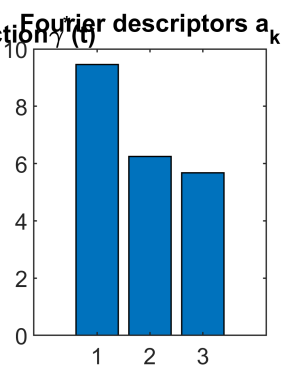
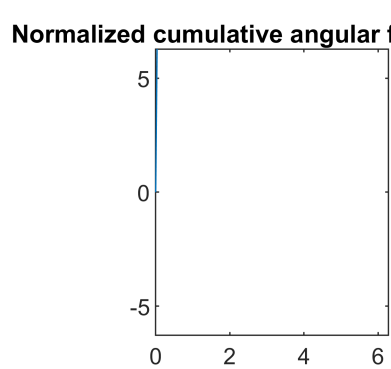
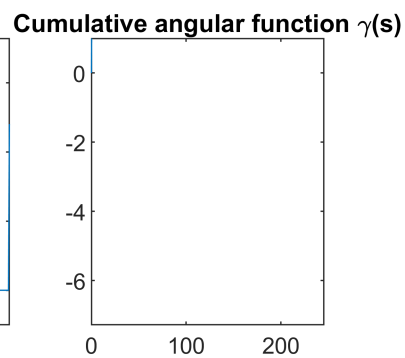
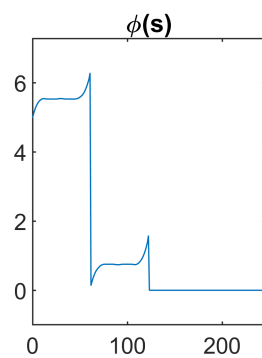
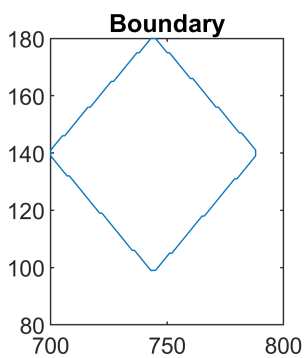
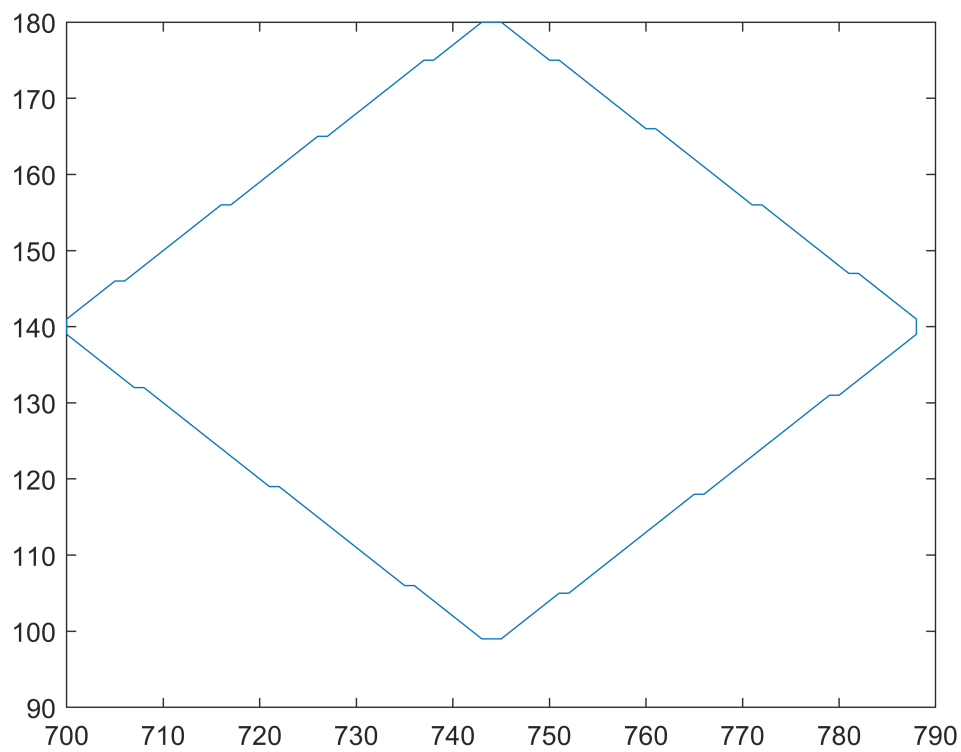
```
if(~islogical(im))
if(ndims(im) > 2), im = rgb2gray(im); end
level = graythresh(im); BW = im2bw(im,level);
else
BW = im;
end
figure , imshow(BW)
```



```
N = 10;  
[B,L,N] = bwboundaries(BW,'noholes');  
for k = 1:N  
    X = B{k}(:,2);  
    Y = B{k}(:,1);  
    contur = [X'; Y'];  
    figure, plot(X, Y);  
    angularFunctionDescriptors(contur, N);  
end
```



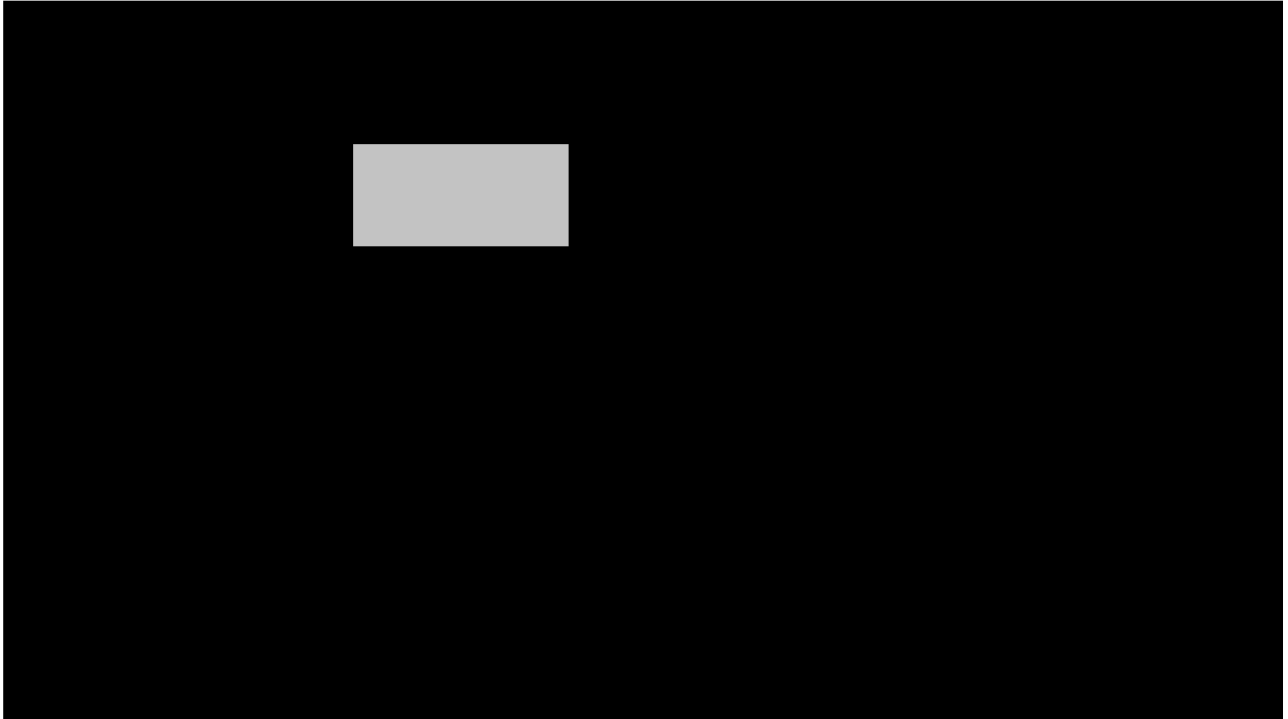




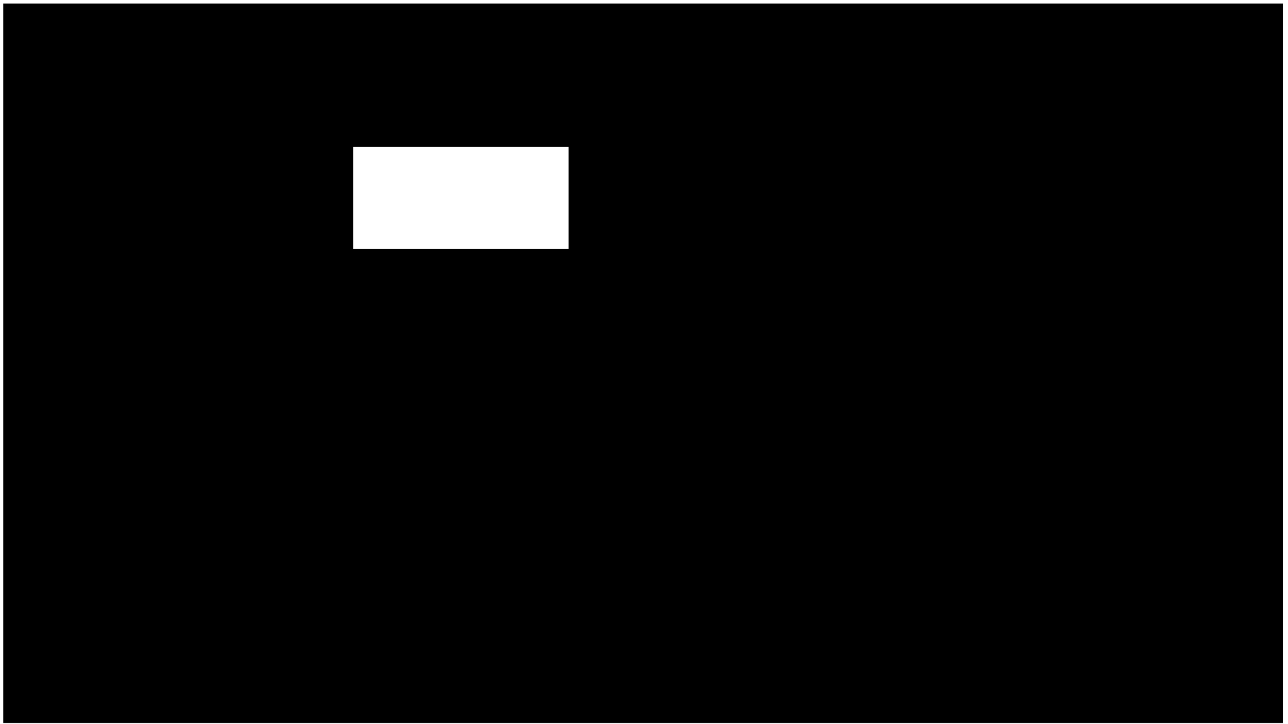
% Observation: No disturbances occur for higher values of N

```
% Ex2
clear variables

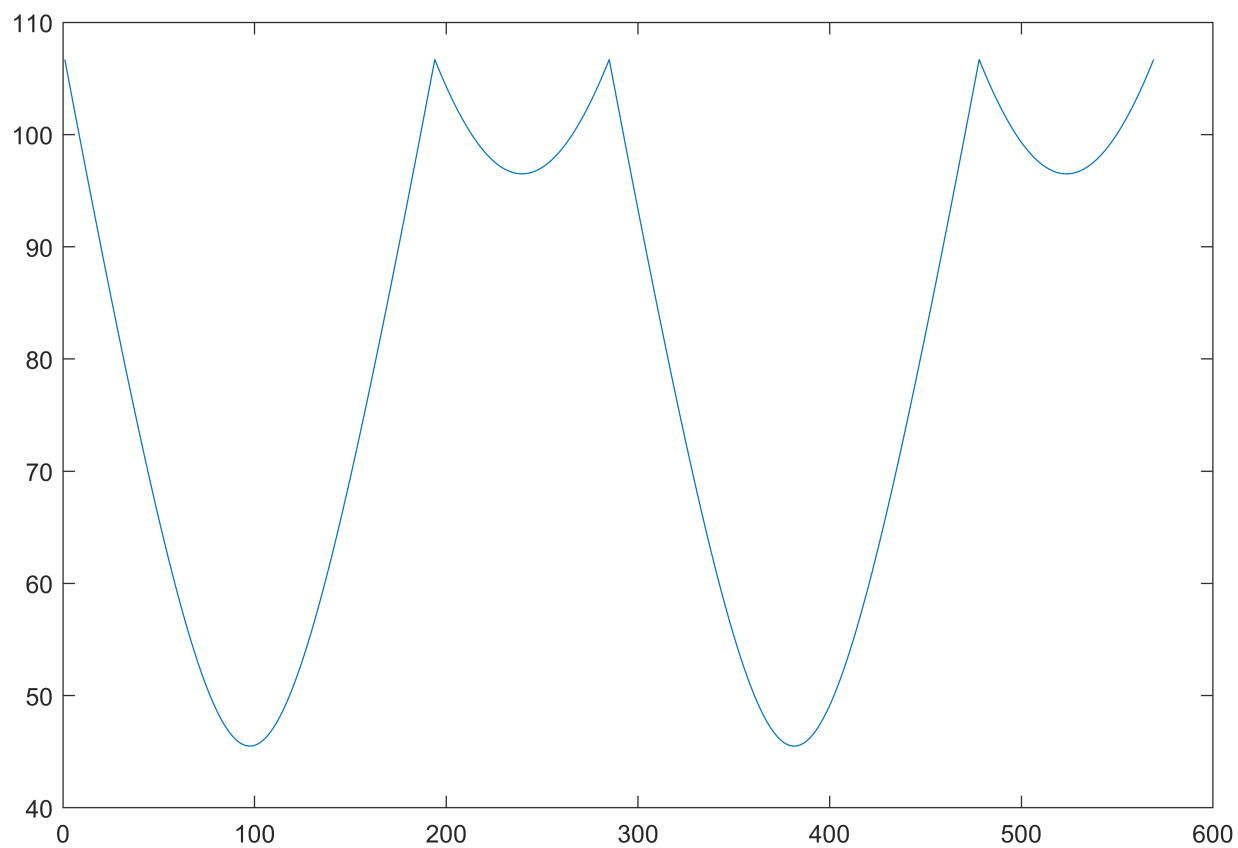
im = imread('Rectangle.png');
imshow(im)
```



```
if(~islogical(im))
    if(ndims(im) > 2), im = rgb2gray(im); end
    level = graythresh(im); BW = im2bw(im,level);
else
    BW = im;
end
figure , imshow(BW)
```



```
N = 10;
[B,L,N] = bwboundaries(BW,'noholes');
stats = regionprops(BW,'Centroid');
coordinates = stats(1).Centroid;
xc = coordinates(1);
yc = coordinates(2);
X = B{1}(:,2);
Y = B{1}(:,1);
r = zeros(length(X), 1);
for k = 1: length(X)
    r(k) = sqrt((X(k)-xc)^2 + (Y(k)-yc)^2);
end
plot(r);
```



% Ex3

clear variables

```
ax=[-44.2,0.6,0.7,-0.4,-4.8,-0.01,-3.7];
bx=[1.2, 0.1, -0.03, -0.2, 0.5, 0.1, 0.9];
ay=[-1.2, -0.1, 0.1, 0.2, 0.6, -0.3, -0.6];
by=[-43.8, 0.8, 0.1, 0.4, 3.7, -0.6, -3.6];
ax0=141.6; ay0=121.3;
m=317;
nc=7;
T=m; w=2*pi/T; tau=T/m;
for n=1:m
    X2(n)=ax0/2;
    Y2(n)=ay0/2;
    for k=1:nc
        X2(n)=X2(n)+ax(k)*cos(k*w*n)+bx(k)*sin(k*w*n);
        Y2(n)=Y2(n)+ay(k)*cos(k*w*n)+by(k)*sin(k*w*n);
    end
end
c2=[X2;Y2];
figure, subplot(321), plot(c2(1,:), c2(2,:)); title('Boundary')
subplot(322), plot(c2(1,:),c2(2,:)); hold on; plot(ax0/2,ay0/2,'*');
    title('Reconstructed boundary')
subplot(323), bar(ax), title('a_x'); subplot(324), bar(bx), title('b_x');
subplot(325), bar(ay), title('a_y'); subplot(326), bar(by), title('b_y');
```

